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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Hongqin, et al.

Art Unit: 1765

Serial No.: 10/666,671

Examiner: Not Yet Assigned

Filed: 9/17/03

For: **METHODS AND APPARATUS OF ETCH PROCESS CONTROL IN FABRICATIONS OF MICROSTRUCTURES**

INFORMATION DISCLOSURE STATEMENT
PURSUANT TO 37 CFR 1.97(b)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-145

Sir:

The attention of the Patent and Trademark Office is hereby directed to the documents listed on the attached PTO Form 1449. Copies of the cited references are enclosed.

No fee or certification is required in connection with this Information Disclosure Statement, since it is being submitted prior to the last of (1) issuance of a first official action on the merits and (2) expiration of the three month period following filing of the above-captioned application.

The above information is presented so that the Patent and Trademark Office can determine any materiality thereof to the claimed invention. It is respectfully requested that the information be considered during the prosecution of this application and that the cited documents be listed on the front page of any patent issuing from this application.

The Patent Office is authorized to charge our Deposit Account No. 501516 for any fee which it deems to be required to effect consideration of this statement.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Gregory R. Muir", is written over a horizontal line.

Gregory R. Muir
Attorney for Applicant(s)
Registration No. 35,293

REFLECTIVITY, INC.
350 Potrero Avenue
Sunnyvale, CA 94085

Tel: 408) 737-8100 x. 136
Fax: 408-737-8153



PTO/SB/08A (10-01)
Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449A/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)		Complete if Known			
		Application Number	10/666,671		
		Filing Date	9/17/03		
		First Named Inventor	Shi		
		Art Unit	1765		
		Examiner Name	Not Yet Assigned		
Sheet	1	of	10	Attorney Docket Number	P118-US

U.S. PATENT DOCUMENTS					
Examiner Initials ¹	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number - Kind Code ² (if known)			
	AA	US- 3,511,727	05-12-1970	Hays, R.G.	
	AB	US- 4,190,488	02-26-1980	Winters, H.F.	
	AC	US- 4,310,380	12-12-1982	Flamm et al.	
	AD	US- 4,498,953	02-12-1985	Cook et al.	
	AE	US- 4,695,700	09-22-1987	Provence et al.	
	AF	US- 4,740,410	04-26-1988	Muller et al.	
	AG	US- 4,749,440	06-07-1988	Blackwood et al.	
	AH	US- 4,789,426	12-06-1988	Pipkin, M.A.	
	AI	US- 5,206,471	04-27-1993	Smith, D.K.	
	AJ	US- 5,330,301	07-19-1994	Brancher, C.D.	
	AK	US- 5,439,553	08-08-1995	Grant et al.	
	AL	US- 5,534,107	07-09-1996	Grav et al.	
	AM	US- 5,672,242	09-30-1997	Jen, J.	
	AN	US- 5,716,495	02-10-1998	Butterbaugh et al.	
	AO	US- 5,726,480	03-10-1998	Pister, K.S.	
	AP	US- 5,753,073	05-19-1998	Jen, J.	
	AQ	US- 5,757,456	05-26-1998	Yamazaki et al.	
	AR	US- 5,835,256	11-10-1998	Huibers, A.	
	AS	US- 5,858,065	01-12-1999	Li et al.	
	AT	US- 6,022,456	02-08-2000	Manning	

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Examiner Initials ¹	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Country Code ³ -Number ⁴ - Kind Code ⁵ (if known)				
	BA	EP-0704884-A2	04-03-1996	Mehta, J.		
	BB	EP-0822582-A2	02-04-1998	Bhardwaj, J.K.		
	BC	EP-0822584-A2	04-04-1998	Bhardwaj, J.K.		
	BD	EP-0838839-A2	04-29-1998	Bhardwaj, J.K.		
	BE	EP-0878824-A2	11-18-1998	McQuarrie et al.		
	BF	EP-0878824-A3	01-19-2000	McQuarrie et al.		
	BG	EP-0955668-A2	11-10-1999	Yao et al.		
	BH	WO-98/05605	02-12-1998	Bhardwaj, J.K.		
	BI	WO-98/13856	04-02-1998	Bhardwaj, J.K.		
	BJ	WO-98/32163	07-23-1998	Tai et al.		

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¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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U.S. PATENT DOCUMENTS					
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		Number - Kind Code ² (if known)			
	AU	US- 6.051.503	04-18-2000	Bhardwai, J.K.	
	AV	US- 6.162.367	12-19-2000	Tai et al.	
	AW	US- 6.277.173 B1	08-21-2001	Sadakata et al.	
	AX	US- 6.290.864 B1	09-18-2001	Patel et al.	
	AY	US- 6.328.801 B1	12-11-2001	Gary et al.	
	AZ	US- 6.334.928 B1	03-12-2002	Sekine et al.	
	AAA	US- 6.355.181 B1	03-12-2002	McQuarrie, A.D.	
	AAB	US- 2001/0002663 A1	06-07-2001	Tai et al.	
	AAC	US- 2002/0033229 A1	03-21-2002	Leboulitz et al.	
		US- 2003/0054588	03-20-2003	Patel, et al.	
		US- 2002/0185699	12-12-2002	Reid	
		US- 2002/0121502	09-15-2002	Patel, et al.	
		US- 2002/0047172	04-25-2002	Reid	
		US- 6.436.229	08-20-2002	Tai, et al.	
		US-			
		US- 2002/0196524	12-26-2002	Huibers, et al.	
		US- 2003/0166342	09-04-2003	Chinn, et al.	
		US- 6.409.876	6-25-2002	McQuarrie, et al.	
		US- 6.396.619	5-28-2002	Huibers, et al.	
		US- 6.576.489	6-10-2003	Leung	

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		Country Code ³ - Number ⁴ - Kind Code ⁵ (if known)				
	BK	WO-99/01887	01-14-1999	Lea et al.		
	BL	WO-99/03313	01-21-1999	Lea et al.		
	BM	WO-99/49506	09-30-1999	McQuarrie, A.D.		
	BN	WO-00/52740	08-08-2000	Bhardwai et al.		
	BO	JP-1982/57098679-A	06-18-1982	Tsunetoshi, A.		
	BP	JP-1983/58130529-A	08-04-1983	Yoshihiro et al.		
	BQ	JP-1985/60057938-A	04-03-1985	Katsumi et al.		
	BR	JP-1986/61053732-A	03-17-1986	Arata et al.		
	BS	JP-1986/61134019-A	06-21-1986	Shinji et al.		
	BT	JP-1986/61181131-A	08-13-1986	Shinji et al.		

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	First Named Inventor	Shi		
	Art Unit	1765		
	Examiner Name	Not Yet Assigned		
Sheet	3	of	10	Attorney Docket Number P118-US

U.S. PATENT DOCUMENTS					
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		Number - Kind Code ² (if known)			
		US- 6,238,581	5-29-2001	Hawkins, et al.	
		US- 6,115,172	9-5-2000	Jeong	
		US- 6,204,080	3-20-2001	Hwang	
		US- 2003/0071015	4-17-2003	Chinn, et al.	
		US- 2002/0164879	11/07/02	Leung, et al.	
		US- 2003/0077878	4-24-2003	Kumar	
		US- 6,197,610	3-6-2001	Toda	
		US- 6,500,356	12-31-2002	Goto, et al.	
		US- 2003/0124848	7-3-2003	Chinn, et al.	
		US- 2003/0219986	11-27-2003	Rattner	
		US- 4,551,197	11-5-1985	Guilmette	
		US- 2004/0069747	4-15-2004	Patel, et al.	
		US- 2002/0195423	12-26-2002	Patel, et al.	
		US- 2004/0035821	2-26-2004	Doan, et al.	
		US- 2002/0163051	11-17-02	Gopal	
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		Country Code ³ - Number ⁴ - Kind Code ⁵ (if known)				
	BU	JP-1986/61187238-A	08-20-1986	Nobuo et al.		
	BV	JP-1986/61270830-A	12-01-1986	Toru, T.		
	BW	JP-1987/62071217-A	04-01-1987	Toru et al.		
	BX	JP-1988/63155713-A	06-28-1988	Tadashi, F.		
	BY	JP-1989/01208834-A	08-22-1989	Nobuo et al.		
	BZ	JP-1989/10217921-A	08-31-1989	Tsuneo et al.		
	CA	JP-1990/02250323-A	10-08-1990	Susumu et al.		
	CB	JP-1991/03012921-A	01-21-1991	Nobuo et al.		
	CC	JP-1992/04096222-A	03-27-1992	Atsuyuki, A.		
	CD	JP-1995/07029823-A	01-31-1995	Hiroshi, T.		

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				Filing Date	9/17/03
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		US-			
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		Country Code ³ - Number ⁴ - Kind Code ⁵ (if known)				
	CE	JP-1997/09251981-A	09-22-1997	Kazuaki et al.		
	CF	JP-1998/10313128-A	11-24-1998	Hanmin et al.		
	CG	JP-1998/10317169-A	12-02-1998	McQuarrie et al.		

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)		Application Number	10/666,671
		Filing Date	9/17/03
		First Named Inventor	Shi
		Group Art Unit	1/65
		Examiner Name	Not Yet Assigned
Sheet 5 of 10	Attorney Docket Number	P118-US	

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T ²
	DA	ALIEV et al., "Development of Si(100) Surface Roughness at the Initial Stage of Etching in F2 and XeF2 Gases Ellipsometric Study", Surface Science 442 (1999), pp. 206-214.	
	DB	GLIDEMEISTER, J.M., "Xenon Difluoride Etching System" (Nov. 17, 1997).	
	DC	HABUKA et al., "Dominant Overall Chemical Reaction in a Chlorine Trifluoride-Silicon-Nitrogen System at Atmospheric Pressure", Japan Journal of Applied Physics Vol. 38 (1999), pp. 6466-6469.	
	DD	HECHT et al., "A Novel X-ray Photoelectron Spectroscopy Study of the Al/SiO2 Interface", J. Appl. Phys. Vol. 57 (June 15, 1985), pp. 5256-5261.	
	DE	HOULE, F.A., "Dynamics of SiF4 Desorption During Etching of Silicon by XeF2", IBM Almaden Research Center (April 15, 1987), pp. 1866-1872.	
	DF	FLAMM et al., "XeF2 and F-Atom Reactions with Si: Their Significance for Plasma Etching", Solid State Technol. 26, 117 (1983).	
	DG	IBBOTSON et al., "Plasmaless Dry Etching of Silicon with Fluorine-containing Compounds", J. Appl. Phys. Vol. 56 No. 10 (Nov. 1984), pp. 2939-2942.	
	DH	IBBOTSON et al., "Comparison of XeF2 and F-atom Reactions with Si and SiO2", Applied Physics Letter, Vol. 44, 1129 (1984).	
	DI	STRELLER et al., "Selectivity in Dry Etching of Si (100) and XeF2 and VUV Light", Elsevier Science B.V., Applied Surface Science Vol. 106 (1996), pp. 341-346.	
	DJ		
	DK		

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		Attorney Docket Number	P118-US

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T ²
	DL	WINTERS, H.F., "Etch Products from the Reaction of XeF ₂ with SiO ₂ , SiO ₃ , Si ₃ N ₄ , SiC, and Si in the Presence of Ion Bombardment", J. Vac. Sci. Technol. B 1(4) (Oct/Dec 1983), pp. 927-931.	
	DM	WINTERS et al., "The Etching of Silicon with XeF ₂ Vapor", Appl. Phys. Letter, Vol. 34(1) (January 1, 1979), pp. 70-73.	
	DN	XACTIX, Inc., Marketing Brochure (June 27, 1999).	
	DO	"Xenon Difluoride Isotropic Etch System: Seeing is Believing", Surface Technology Systems Ltd. brochure, Newport, UK (date unknown).	
	DP	Assorted promotional literature, Surface Technology Systems Ltd., Newport, UK (July 28, 1999).	
		Kurt Williams, Etch Rates for Micromachining Processing-Part II, 2003 IEEE, Pgs 761-778, Journal of Microelectromechanical Systems, Vol. 12, No. 6, December 2003.	

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	BA	ANDERSON, H.M., "Plasma Diagnostics for Semiconductor Processing", 2000 Digest of the LEOS Topical Meetings (July 24 - 28, 2000), pp. 117-118 (abstract only).	
	BB	BARYSHEV et al., "Monitoring of SiO_2/Si Plasma Etching and End-Point Detection", Mikroelektronika (Russia), Vol. 25, No. 5 (Sept/Oct 1996), pp. 373-379 (abstract only).	
	BC	BASSOM et al., "Modeling and Optimizing XeF_2 -enhanced FIB Milling of Silicon", 25th International Symposium for Testing and Failure Analysis, Santa Clara, CA (Nov. 14 -18, 1999), pp. 255-261 (abstract only).	
	BD	BERG et al., "Real-Time Control of Etching Processes: Experimental Results", Proceedings of the SPIE - The International Society for Optical Engineering, Vol. 3213 (1997), pp. 249-260 (abstract only).	
	BE	CHAMBERS et al., "Endpoint Uniformity Sensing and Analysis in Silicon Dioxide Plasma Etching Using In Situ Mass Spectrometry", J. Vac. Sci. Technol. B, Microelectron. Nanometer Struct., Vol. 16, No. 6 (Nov/Dec 1998), pp. 2996-3002 (abstract only).	
	BF	CHAN et al., "Gas Phase Pulse Etching of Silicon for MEMS with Xenon Difluoride", Engineering Solutions for the Next Millenium: 1999 IEEE Canadian Conference on Electrical and Computer Engineering, Edmonton, Alberta, Vol. 3 (May 9 - 12, 1999), pp. 1637-1642 (abstract only).	
	BG	CHANG et al., "Gas-Phase Silicon Micromachining with Silicon Difluoride", Proceedings of the SPIE - The International Society for Optical Engineering, Vol. 2641 (1995), pp. 117-128 (abstract only).	
	BH	CHEN et al., "Spatially Resolved Endpoint Detector for Plasma Etcher", 1997 IEEE International Symposium on Semiconductor Manufacturing Conference Proceedings, San Francisco, CA (Oct. 6 - 8, 1997), pp. B45 - B48 (abstract only).	
	BI	CHU et al., "Controlled Pulse-Etching with Xenon Difluoride", International Solid State Sensors and Actuators Conference (Transducers '97), Chicago, IL, Vol. 1 (June 16 - 19, 1997), pp. 665-668 (abstract only).	
	BJ	HEINRICH et al., "Multichannel Process Monitor for Real-Time Film Thickness and Rate Measurements in Dry Etching and Deposition", Vacuum, Vol. 51, No. 4, (Dec. 1998), pp. 497-502 (abstract only).	
	BK	KOHLER et al., "Fabrication of Microlenses by Plasmaless Isotropic Etching Combined with Plastic Moulding", Sens. Actuators A, Phys. (Switzerland), Vol. A53, No. 1-3 (May 1996), pp. 361-363 (abstract only).	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)			Application Number	10/666,671	
			Filing Date	9/17/03	
			First Named Inventor	Shi	
			Group Art Unit	1765	
			Examiner Name	Not Yet Assigned	
Sheet	8	of	10	Attorney Docket Number	P118-US

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
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	BL	LI et al., "Mass Spectrometric Measurements on Inductively Coupled Fluorocarbon Plasmas: Positive Ions, Radicals and Endpoint Detection", J. Vac. Sci. Technol. A, Vac. Surf. Films, Vol. 17, No. 5 (Sept. 1997), pp. 2438-2446 (abstract only).	
	BM	LIAMANOND et al., "Production Data Based Optimal Etch Time Control Design for a Reactive Ion Etching Process", IEEE Trans. Semicond. Manuf., Vol. 12, No. 1 (Feb. 1999), pp. 139-147 (abstract only).	
	BN	LITVAK, H.E., "End Point Control Via Optical Emission Spectroscopy", J. Vac. Sci. Technol. B, Microelectron. Nanometer Struct., Vol. 14, No. 1 (Jan/Feb 1996), pp. 516-520 (abstract only).	
	BO	LU et al., "Effluent Monitoring with FTIR Spectroscopy for Low Open Area Oxide Etch Endpoint Detection", 8th International Symposium on Semiconductor Silicon, San Diego, CA, Vol. 2 (May 4 - 8, 1998), pp. 1250-1261 (abstract only).	
	BP	MAYNARD et al., "Plasma Etching of Submicron Devices: In Situ Monitoring and Control by Multi-Wavelength Ellipsometry", Thin Solid Films (Switzerland), Vol. 313-314, No. 1-2 (Feb. 1998), pp. 398-405 (abstract only).	
	BQ	MELVILLE et al., "Volatile Products and Endpoint Detection in Reactive Ion Etching of III-V Compounds with a Broad Beam ECR Source", Nuclear Instruments & Methods in Physics Research, Section B (Beam Interactions with Materials and Atoms), Vol. B106, No. 1-4 (Dec. 1995), pp. 179-182 (abstract only).	
	BR	MUTHUKUMARAN et al., "Gas-Phase Xenon Difluoride Etching of Microsystems Fabricated Through the Mitel 1.5-μm CMOS Process", Can. J. Electr. Comput. Eng. (Canada), Vol. 25, No. 1 (Jan. 2000), pp. 35-41 (abstract only).	
	BS	PERRIN, J., "Mass Spectrometry of Reactive Plasmas", Plasma Processing of Semiconductors, Chateau de Bonas, France (June 17 - 28, 1996), pp. 397-431 (abstract only).	
	BT	RICHTER et al., "Exhaust Gas Monitoring: New Window Into Semiconductor Processing", Solid State Technol., Vol. 42, No. 5 (May 1999), pp. 61, 63-64, 68, 70-71 (abstract only).	
	BU	SAITO et al., "Low Temperature Plasmaless Etching of Silicon Dioxide Film Using Chlorine Trifluoride Gas with Water Vapor", J. Electrochem. Soc., Vol. 147, No. 12 (Dec. 2000), pp. 4630-4632 (abstract only).	
	BV	SEBEL et al., "Etching of Si Through a Thick Condensed XeF ₂ Layer", J. Vac. Sci. Technol. A, Vac. Surf. Films, Vol 18, No. 5 (Sept/Oct 2000), pp. 2090-2097 (abstract only).	

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	BW	SEBEL et al., "Reaction Layer Dynamics in Ion-Assisted Si/XeF ₂ Etching: Temperature Dependence", J. Vac. Sci. Technol. A, Vac. Surf. Films, Vol. 18, No. 6, (Nov. 2000), pp. 2759-2769 (abstract only).	
	BX	SEBEL et al., "Silicon Etch Rate Enhancement by Traces of Metal", J. Vac. Sci. Technol. A, Vac. Surf. Films, Vol. 17, No. 3, (May/June 1999), pp. 755-762 (abstract only).	
	BY	SUGANO et al., "Study on XeF ₂ Pulse Etching Using Wagon Wheel Pattern", Proceedings of the 1999 International Symposium on Micromechanics and Human Science: Towards the New Century, Nagoya, Japan (Nov. 23 - 26, 1999), pp. 163-167 (abstract only).	
	BZ	SUN et al., "Sensitive Plasma Etching Endpoint Detection Using Tunable Diode Laser Absorption Spectroscopy", Appl. Phys. Lett., Vol. 64, No. 21 (May 23, 1994), pp. 2779-2781 (abstract only).	
	CA	THOMAS et al., "Minimized Response Time of Optical Emission and Mass Spectrometric Signals for Optimized Endpoint Detection", J. Vac. Sci. Technol. B, Microelectron. Nanometer Struct., Vol. 14, No. 4 (July/Aug 1996), pp. 2531-2536 (abstract only).	
	CB	TODA et al., "Thin Beam Bulk Micromachining Based on RIE and Xenon Difluoride Silicon Etching", International Solid State Sensors and Actuators Conference (Transducers '97), Chicago, IL, Vol. 1 (June 16 - 19, 1997), pp. 671-674.	
	CC	VUGTS et al., "Si/XeF ₂ Etching: Reaction Layer Dynamics and Surface Roughening", J. Vac. Sci. Technol. A, Vac. Surf. Films, Vol. 14, No. 5 (Sept/Oct 1996), pp. 2780-2789 (abstract only).	
	CD	VUGTS et al., "Si/XeF ₂ Etching: Temperature Dependence", J. Vac. Sci. Technol. A, Vac. Surf. Films, Vol. 14, No. 5 (Sept/Oct 1996), pp. 2766-2774 (abstract only).	
	CE	WAN et al., "Electron Cyclotron Resonance Plasma Reactor for SiO ₂ Etching: Process Diagnostics, End-Point Detection, and Surface Characterization", J. Vac. Sci. Technol. A, Vac. Surf. Films, Vol. 13, No. 4 (July/Aug 1995), pp. 2035-2043 (abstract only).	
	CF	WANG et al., "Gas-Phase Silicon Etching with Bromine Trifluoride", International Solid State Sensors and Actuators Conference (Transducers '97), Chicago, IL, Vol. 2 (June 16 - 19, 1997), pp. 1505-1508 (abstract only).	
	CG	WARD, P.P., "Plasma Process Control with Optical Emission Spectroscopy", 17th IEEE/CPMT International Electronics Manufacturing Technology Symposium: Manufacturing Technologies - Present and Future, Austin, TX (Oct. 2 - 4, 1995), pp. 166-169 (abstract only).	

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	CH	WARNEKE, et al., "In Situ Characterization of CMOS Post-Process Micromachining", Sens. Actuators A, Phys. (Switzerland), Vol. A89, No. 1-2 (March 20, 2001), pp. 142-151 (abstract only).	
	CI	WELCH et al., "Breaking the 0.5 Percent Exposed Area Etch Endpoint Barrier", Semicond. Int., Vol. 19, No. 8 (July 1996), pp. 269-270, 272, 274, 276 (abstract only).	
	CJ	WODECKI, N.D., Low Open Area Multi-Layered Dielectric Film Etch Endpoint Detection Using EndPoint Plus (TM)", Proceedings of the SPIE - The International Society for Optical Engineering, Vol. 3882 (1999), pp. 231-238 (abstract only).	
	CK	WONG et al., "Endpoint Prediction for Polysilicon Plasma Etch Via Optical Emission Interferometry", J. Vac. Sci. Technol. A, Vac. Surf. Films, Vol. 15, No. 3, Pt. 2 (May/June 1997), pp. 1403-1408 (abstract only).	
	CL	YUE et al., "Plasma Etching Endpoint Detection Using Multiple Wavelengths for Small Open Area Wafers", J. Vac. Sci. Technol. A, Vac. Surf. Films, Vol. 19, No. 1 (Jan. 2001), pp. 66-75 (abstract only).	

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